Please type a sign(+) inside this box → ⊞

PTO/SB/05 (2/98)
Approved for use through 09/30/2000. OMB 0651-0032
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

02/23/00 jc712 U.S. PTO

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR § 1 53(b))

Attorney Docket No.	*0652.2020002/LEA/ALF*
First Inventor or Application Identifier	*Joachim EICHER*
Title	*Cartridge for a Liquid*
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

02/23/00 jc675 U.S. PTO 09/511267

1. ☐ * Fee Transmittal Form (*e.g.*, PTO/SB/17)
(Submit an original, and a duplicate for fee processing)

2. ☒ Specification [Total Pages 21]
(preferred arrangement set forth below)
- Descriptive title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings *(if filed)*
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

3. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 4]

4. ☐ Oath or Declaration [Total Pages _____]
a. ☐ Newly executed (original or copy)
b. ☐ Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional with Box 17 completed)* ***[Note Box 5 below]***
i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR §§ 1.63(d)(2) and 1.33(b).

5. ☐ Incorporation By Reference *(useable if Box 4b is checked)*
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. ☐ Microfiche Computer Program *(Appendix)*

7. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
a. ☐ Computer Readable Copy
b. ☐ Paper Copy (identical to computer copy)
c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. ☐ Assignment Papers (cover sheet & document(s))
9. ☐ 37 CFR 3.73(b) Statement (when there is an assignee) ☐ Power of Attorney
10. ☐ English Translation Document *(if applicable)*
11. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
12. ☐ Preliminary Amendment
13. ☒ Two (2) Return Receipt Postcards (MPEP 503) *(Should be specifically itemized)*
14. ☐ *Small Entity Statement(s) *(PTO/SB/09-12)* ☐ Statement filed in prior application, Status still proper and desired
15. ☐ Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. ☒ Other· 37 C.F.R. § 1.136(a)(3) Authorization
☐ Other·

**NOTE FOR ITEMS 1 & 14 IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F R § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C F.R §1.28).*

17. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in a preliminary amendment:*

☐ Continuation ☐ Divisional ☐ Continuation-in-Part (CIP) of prior application No: ____/_____

Prior application information: Examiner _____ *Group/Art Unit:* _____

18. CORRESPONDENCE ADDRESS

☐ ***Customer Number or Bar Code Label*** *(Insert Customer No. or Attach bar code label here)* ***or*** ☒ ***Correspondence address below***

NAME	STERNE, KESSLER, GOLDSTEIN & FOX P L.L.C.				
	Attorneys at Law				
ADDRESS	Suite 600, 1100 New York Avenue, N.W.				
CITY	Washington	*STATE*	DC	*ZIP CODE*	20005-3934
COUNTRY	USA	*TELEPHONE*	(202) 371-2600	*FAX*	(202) 371-2540

NAME (Print/Type)	Albert L. Ferro	*Registration No. (Attorney/Agent)*	44,679
SIGNATURE		*Date*	2/23/00

Burden Hour Statement this form is estimated to take 0 2 hours to complete Time will vary depending upon the needs of the individual case Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231 DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
ATTORNEYS AT LAW
1100 NEW YORK AVENUE, N.W., SUITE 600
WASHINGTON, D.C. 20005-3934

(202) 371-2600
FACSIMILE (202) 371-2540, (202) 371-6566

ROBERT GREENE STERNE
EDWARD J KESSLER
JERRE A GOLDSTEIN
SAMUEL L FOX
DAVID K.S CORNWELL
ROBERT W ESMOND
TRACY-GENE G DURKIN
MICHELE A CIMBALA
MICHAEL B RAY
ROBERT E SOKOHL
ERIC K. STEFFE
MICHAEL Q LEE

STEVEN R LUDWIG
JOHN M COVERT*
LINDA E ALCORN
RAZ E FLESHNER
ROBERT C MILLONIG
MICHAEL V MESSINGER
JUDITH U KIM
TIMOTHY J SHEA, JR
DONALD R MCPHAIL
PATRICK E GARRETT
STEPHEN G WHITESIDE
JEFFREY T HELVEY*

HEIDI L KRAUS
JEFFREY R KURIN
RAYMOND MILLIEN
PATRICK D O'BRIEN
LAWRENCE B BUGAISKY
CRYSTAL D SAYLES*
EDWARD W YEE
ALBERT L FERRO*
DONALD R BANOWIT
PETER A JACKMAN
MOLLY A MCCALL

TERESA U MEDLER
JEFFREY S WEAVER
KRISTIN K VIDOVICH
KENDRICK P PATTERSON
DONALD J FEATHERSTONE
GRANT E REED
VINCENT L CAPUANO
JOHN A HARROUN*
MATTHEW M CATLETT*
NATHAN K KELLEY*
ALBERT J FASULO II *

KAREN R MARKOWICZ**
SUZANNE E ZISKA**
BRIAN J DEL BUONO**
ANDREA J KAMAGE**
NANCY J LEITH**
TARJA H NAUKKARINEN**

*BAR OTHER THAN D C
**REGISTERED PATENT AGENTS

February 23, 2000

WRITER'S DIRECT NUMBER:
(202) 371-2643
INTERNET ADDRESS:
AFERRO@SKGF.COM

Assistant Commissioner for Patents
Washington, D.C. 20231

Box Patent Application

Re: U.S. Non-Provisional Utility Patent Application under 37 C.F.R. § 1.53(b)
Appl. No. To be assigned; Filed: Herewith
For: **Cartridge for a Liquid**
Inventors: Eicher *et al.*
Our Ref: 0652.2020002/LEA/ALF

Sir:

The following documents are forwarded herewith for appropriate action by the U.S. Patent and Trademark Office:

1. USPTO Utility Patent Application Transmittal Form PTO/SB/05;

2. U.S. Utility Patent Application entitled:

Cartridge for a Liquid

and naming as inventors:

Joachim EICHER
Johannes GESER
Matthias HAUSMANN
Michael SCHYRA
Gilbert WUTTKE
Andreas FIOL
Heinrich KLADDERS

Dieter HOCHRAINER
Bernd ZIERENBERG

the application comprising:

a. A specification containing:

(i) 12 pages of description prior to the claims;

(ii) 8 pages of claims (38 claims);

(iii) a one (1) page abstract;

b. 4 sheets of drawings: (Figures 1, 2, 3a, 3b, 4a and 4b);

3. 37 C.F.R. § 1.136(a)(3) Authorization to Treat a Reply As Incorporating An Extension of Time; and

4. Two (2) return postcards.

It is respectfully requested that, of the two attached postcards, one be stamped with the filing date of these documents and returned to our courier, and the other, prepaid postcard, be stamped with the filing date and unofficial application number and returned as soon as possible.

This patent application is being submitted under 37 C.F.R. § 1.53(b) without Declaration and without filing fee.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Albert L. Ferro
Attorney for Applicants
Registration No. 44,679

Enclosures
LEA/ALF:vrb
P:\USERS\VBAYNE\Ferro-3\0652\202-2\NewAppl-ptoltr
SKGF Rec 9/22/98dcw

Boehringer Ingelheim
International GmbH

Cartridge for a liquid

The invention concerns a cartridge for a liquid, which can be connected to a draw-off or dispensing device. The dispensing device includes an upper portion which accommodates the cartridge and a lower portion which can be pushed on over the connected cartridge. The upper portion of the device is provided with a connecting portion for the cartridge and with a dispensing connection portion for drawing off and dispensing the liquid.

Liquids in accordance with the present invention can be solutions, suspensions or emulsions. Preferred liquids are those which contain an active substance. Active substances can be pharmacologically active substances for treatment of the human or animal body or active substances for diagnostic purposes or for a cosmetic use.

The invention aims to adapt an economically manufacturable cartridge of that kind to specific demands.

Different thin-wall containers of the general kind set forth, for a liquid, are known, which are not diffusion-tight in relation to volatile constituents of the liquid. In that case a part of the liquid is lost by diffusion and the level of concentration of constituents of the liquid changes in a manner which is possibly unacceptable. Containers of that kind are suitable for a relatively short storage time. In the case of other containers of the general kind set forth, unacceptable changes in the liquid occur due to diffusion or due to the action of air, prior to or during the period of use. Particularly in the case of containers for a liquid which contains medical active substances, there is a need to satisfy intensified

demands in order to avoid unacceptable adverse effects on the quality of the medicament.

Accordingly the object of the invention is to develop a cartridge for a liquid, which can be economically produced even in large numbers and which in the filled condition can be stored over a long period of time even under difficult conditions. The invention seeks to provide that the liquid can be easily drawn off and not involve contact with the environment. The invention further seeks to provide that the cartridge can be connected to a draw-off or dispensing device as easily as possible and interchangeably and that the cartridge can be reliably handled even by unskilled persons. The invention further seeks to provide that the cartridge is also suitable for a liquid which contains medical active substances and satisfies the intensified conditions which occur in that situation.

In accordance with the invention that object is attained by a cartridge which can be connected to a draw-off or dispensing device. The dispensing device includes an upper portion which accommodates the cartridge and a lower portion which can be pushed on over the connected cartridge. The upper portion of the device is provided with a connection portion for the cartridge and with a draw-off or dispensing connection portion for drawing off the liquid. The cartridge can be in the form of a triple-shell container comprising an outer stiff casing, a container which is stable in respect of shape and which is disposed in the casing, and a collapsible bag which is arranged in the container that is stable in respect of shape and which contains the liquid. The stiff casing can have a bottom which can be provided with an opening. The container which is stable in respect of shape can also have an opening and can be closed with a stopper provided with an insertion connection portion. The stopper can form a sealingly closing, centred guide means for the draw-off connection portion. The stopper can be non-releasably connected by the stiff casing to the container which is stable in respect of shape. The cartridge can be

releasably connected to the connection portion at the upper portion of the dispensing device.

The connection between the cartridge and the connection portion of the device can be in the form of a plug-in connection, a screw connection or a bayonet connection. This connection can preferably be a releasable connection. Optionally, it can be in the form of a non-releasable connection or a connection which is difficult to release.

The stopper can preferably comprise a thermoplastic material and can be connected to the container that is stable in respect of shape, in force-locking and positively locking relationship, by means of a snap-action connection. The stopper can also be non-releasably welded to the container that is stable in respect of shape and that comprises thermoplastic material, by the materials merging together. The stopper can be provided in the insertion connection portion with a funnel-shaped centred guide means for the dispensing or draw-off connection portion. The guide means can be provided with guide ribs. The stopper can sealingly embrace the draw-off connection portion and can be in the form of a press fit for the latter. It may be desirable for the end of the insertion connection portion, that is towards the internal space of the collapsible bag, to be closed by a diaphragm which can be arranged inclinedly relative to the axis of the insertion connection portion and which can be pierced when the draw-off connection portion is introduced into the cartridge. That diaphragm prevents the liquid from escaping into the insertion connection portion during storage of the cartridge.

A sealing disc which can be provided with sealing beads or ridges can be provided between the upper edge of the container which is stable in respect of shape, and the inside of the stopper. The inside of the stopper can be provided with a sealing lip or a plurality of sealing lips which are pressed into the sealing disc on the upper edge of the container which is stable in respect of shape.

Apart from its opening, the stiff casing is diffusion-tight in relation to gases and liquids. This casing can be a one-piece deep-drawn metal casing, preferably of aluminium. The stiff casing can also be of a two-piece construction; then, the two parts of the casing are joined together and sealed off relative to each other by way of sealing elements by welding or by adhesive. The stiff casing can also comprise a plastic material, preferably a thermoplastic material.

The stiff casing can have a projecting bead or ridge at the edge of its bottom. The bottom can be provided with a recess which is arranged centrally as an inwardly turned region of the bottom.

The stiff casing preferably has at the centre point of the bottom an opening which can be in the form of a bore. It is additionally possible to provide in the recess in the bottom of the casing an insert which preferably comprises plastic material and which includes an opening in the form of a micro-opening which communicates with the opening in the bottom of the stiff casing. A filter can be disposed in front of the micro-opening within the insert.

The opening in the bottom of the stiff casing can be of a diameter of between 0.1 mm and 5 mm when the cross-section involved is circular. The micro-opening in the insert, when a circular cross-section is involved, is between 10 µm and 500 µm in diameter and between 100 µm and 5000 µm in length. The micro-opening makes it possible to adjust to a desired value the time for pressure equalisation between the internal space in the cartridge and its environment.

The stiff casing of metal can be provided in the proximity of its open end with a peripherally extending crease which embraces the stopper in force-locking and positively locking relationship. The stiff casing of thermoplastic material can be welded to the stopper, with merging of the materials thereof. In addition in its upper part the stiff casing can be provided with a peripherally extending, outwardly open groove which extends around the lower edge of the stopper. At its open end the stiff

casing may have a flanged-over portion which embraces the upper edge of the stopper.

The stiff casing can be provided with a plurality of projections which protrude into the interior of the casing and which support the container which is stable in respect of shape within the stiff casing. Preferably three projections are disposed in the middle to the lower region of the stiff casing, which are disposed in a plane which is perpendicular to the axis of the casing. In the case of a stiff casing of metal, those projections can be produced when flanging the open end of the stiff casing.

The cartridge can be sealed in the region of the stopper with a - possibly diffusion-tight - sealing foil which closes the open end of the insertion connection portion. The outside of the casing bottom can also be provided with a - possibly diffusion-tight - sealing foil which covers over the opening in the bottom or the insert in the bottom of the casing. Both sealing foils prevent the penetration of dirt into the openings beneath the foils and prevent the diffusion of constituents of the liquid during the time for which the cartridge is stored. Both sealing foils are detached or pierced only immediately prior to first regular use of the cartridge.

The releasable connection between the cartridge and the connection portion of the dispensing device can be a plug-type connection in which the connection portion is provided with a plurality of snap hooks which engage into the peripherally extending groove in the upper part of the stiff casing after the cartridge has been inserted into the device. The plug connection can advantageously also be used for other containers of the general kind set forth, in which case the container which is stable in respect of shape or the stopper includes a groove into which the snap hooks engage.

Snap hooks of plastic material can be provided with a metal spring element which maintains the spring property of the snap hooks over a long period of time and at elevated temperature.

A free space which is covered by the sealing foil can be provided in the central region of the sealing foil on the outside of the bottom of the casing. A rigid or resilient piercing device can be disposed on the inside of the bottom of the lower portion of the device, the piercing device piercing the sealing foil disposed on the underside of the bottom of the casing, prior to the first withdrawal of a part of the liquid from the cartridge. That opens the opening in the bottom of the casing or the micro-opening in the insert and permits air to pass into the space inside the cartridge.

To remove a used cartridge from the dispensing device, it is possible to use a withdrawal aid which is pushed under the bead or ridge at the bottom of the stiff casing, thereby to make it easier to pull the cartridge out.

Before the cartridge is connected to the dispensing device, the sealing foils on the stopper and on the bottom of the cartridge are detached or those sealing foils are pierced when the cartridge is connected to the dispensing device. A difference in pressure which possibly prevails between the interior of the cartridge and the environment around the cartridge is equalised through the opening in the bottom of the stiff casing.

When a quantity of liquid is drawn out of the cartridge connected to the dispensing device, the collapsible bag collapses and its volume is reduced by the volume of the quantity of liquid which is drawn off. As a result there is a reduced pressure in the gas space of the cartridge (this is the free space between the outside of the collapsible bag and the inside of the stiff casing) in comparison with the pressure in the ambient atmosphere around the cartridge. That pressure difference is equalised in a relatively short period of time if the stiff casing is thin-walled and is provided with a bore in the region of between 0.1 mm and 5 mm.

If the cartridge is provided in the bottom of the stiff casing with an insert which includes a micro-opening, it is possible to adjust the time for pressure equalisation between the gas space in the cartridge and the

ambient atmosphere. For example with a volume of 3 millilitres of the gas space in the cartridge and a pressure difference of 20 hPa (20 mbar) between the ambient atmosphere around the cartridge and the gas space in the cartridge, in the case of a circular micro-opening of a length of 200 µm and a diameter of between 80 µm and 50 µm, it is possible to achieve a half-value time for pressure equalisation of between 2 hours and 13 hours.

In the case of a pressure equalisation time which is adapted to the usual time interval between two operations of drawing off liquid from the cartridge, the diffusion of constituents of the liquid out of the collapsed bag is made more difficult.

The cartridge according to the invention can be for example 55 mm in length and 17 mm in diameter. The stopper can have an insertion connection portion whose inside diameter gives a firm press fit on a dispensing connection portion of an outside diameter of 2 mm.

The cartridge according to the invention can be used in an atomiser as is shown n Figures 6a and 6b in WO - 97/12687. The cartridge (1) of the present invention corresponds to the supply container (71) in Figures 6a and 6b, the spring portion of the locking clamping mechanism, in the form of connection portion (2), corresponds to the spring portion (56), and the lower portion (3) of the device corresponds to the lower housing portion (70).

The cartridge may contain an aqueous or alcoholic liquid.

When an aqueous liquid is involved, the container which is stable in respect of shape and the stopper can comprise polypropylene. The collapsible bag can comprise polyethylene. The stiff casing can comprise plastic material, preferably polypropylene. The opening in the bottom of the stiff casing can be a bore. The stopper for the container which is stable in respect of shape can be provided with an insertion connection portion which, at its end towards the internal space, can be closed with a diaphragm which is inclined relative to the axis of the insertion connection

portion. The insertion connection portion can involve a press fit for the dispensing connection portion. The stopper can be connected to the container which is stable in respect of shape by a snap connection. The releasable plug-in connection between the cartridge and the connection portion of the dispensing device can be a snap connection in which the snap hooks in the connection portion of the dispensing device engage into the peripherally extending groove in the upper region of the cartridge. the inside of the bottom of the lower portion of the device which is fitted on the upper portion can be provided with a resilient piercing device for the sealing foil on the underside of the bottom of the casing.

In the case of an alcoholic liquid the container which is stable in respect of shape and the stopper can comprise polypropylene. The collapsible bag can comprise polyethylene. The stiff casing can comprise metal, preferably aluminium. The recess in the bottom of the stiff casing may receive an insert with a micro-opening which communicates with the bore in the bottom of the casing. The stopper provided with an insertion connection portion, for the container which is stable in respect of shape, can be closed at its end towards the internal space by a diaphragm which is inclined with respect to the axis of the insertion connection portion. The insertion connection portion can be provided with a sealing closing centred guide means for the dispensing connection portion, the guide means being in the form of a press fit. The stopper can be non-releasably connected to the container which is stable in respect of shape, by means of the stiff casing. The releasable plug connection between the cartridge and the connection portion of the dispensing device can be a snap connection in which the snap hooks in the connection portion of the dispensing device engage into the peripherally extending groove in the upper region of the cartridge. The inside of the bottom of the fitted-on lower portion of the device can be provided with a resilient piercing device for the sealing foil on the underside of the bottom of the casing.

The cartridge according to the invention can be filled with a medical liquid which for example contains a pharmacologically active substance and for example water, ethanol or mixtures thereof.

WO - 98/27959 describes stabilised aqueous medicament preparations for producing propellent gas-free aerosols for inhalation. Attention is directed to the formulations which are claimed therein and set forth in the Examples.

Suitable medicament preparations in an ethanol solution are set forth for example in WO - 97/01329, and in particular attention is directed to the active substances referred to therein (see therein pages 2 and 3) and the stabilised formulations claimed therein.

As medical active substances it is possible to use Berotec (Fenoterol hydrobromide); 1-(3,5-dihydroxy-phenyl)-2-[[1-(4-hydroxy-benzyl)-ethyl]-amino]-ethanol hydrobromide), Atrovent (Ipratropium bromide), Berodual (combination of Fenoterol hydrobromide and Ipratropium bromide), Salbutamol, Salbutamol sulphate, Combivent, Oxivent (Oxitropium bromide), Ba 679 (Tiotropium bromide), BEA 2108 (di-(2-thienyl)-glycolic acid tropenol ester), Flunisolid, Budesonid, Beclomethasone and others.

The cartridge according to the invention enjoys the following advantages:

- The concentration of the medical liquid contained in the sealed cartridge varies only to a tolerable extent even over a storage time of several years and at elevated storage temperature.
- The content of the cartridge is highly effectively protected from contamination.
- The cartridge when fitted into the dispensing device can be used over several months.
- The half-value time for pressure equalisation can be adjusted by the shape of the micro-opening.
- The cartridge can be produced in medically acceptable form.

- The unmodified original condition of the cartridge and the content thereof can be readily perceived within the specified period of usability by virtue of the intact sealing foils.
- The cartridge has a high degree of functional reliability; mishandling is avoided.
- The cartridge is securely held in the dispensing device.
- The fixedly closed cartridge is child-proof and makes it more difficult to manipulate the content thereof.
- The empty cartridge can be easily pulled out of the dispensing device because of the ridge at the bottom of the stiff casing.

The cartridge according to the invention which contains a medical liquid can be used to produce an inhalable aerosol by means of an atomiser. The aerosol can serve for treating illnesses.

The cartridge according to the invention is described in greater detail by means of the drawings.

Figure 1 shows the cartridge 1, the connection portion 2 of the draw-off or dispensing device and the lower portion 3 of the device which is pushed over the connected cartridge. The stiff casing 4 contains the container 5 which is stable in respect of shape, with the collapsible bag 6. The container which is stable in respect of shape is closed by the stopper 7 and the snap connection 8. Disposed between the upper edge of the container which is stable in respect of shape and the underside of the stopper is the sealing disc 9 into which the sealing lip 10 is pressed. The stiff casing includes the peripherally extending groove 11 against which the lower edge of the stopper bears. The peripherally extending crease 12 in the stiff casing is pressed into the stopper. The stopper is held at its top side by the flanged-over portion 13 of the upper end of the stiff casing. The opening 14 is provided in the container 5 which is stable in respect of shape.

The connection portion of the dispensing device includes the dispensing or draw-off connection portion 15 which has already pierced

the sealing foil 16 on the top side of the stopper and which has penetrated into the insertion connection portion 17. When the cartridge is further pushed onto the dispensing connection portion 15 it penetrates the region 17a of the press fit and pierces the inclined diaphragm 18 at the end of the insertion connection portion 17. The snap hooks 19 on the connection portion 2 of the dispensing device engage from the outside into the peripherally extending groove 11 in the stiff casing.

The stiff casing 4 is provided in its central region with projections 4a which are disposed in a plane which is perpendicular to the axis of the casing. Those projections support the container which is stable in respect of shape.

The stiff casing is provided at its bottom edge with the projecting ridge or bead 20. Disposed in the centre of the recess in the form of the inwardly inverted region 21 is the opening 22 in the stiff casing. The bottom of the stiff casing is covered by the sealing foil 23. The free space 24 is to be found between the sealing foil and the inwardly curved region. The resilient piercing device 25 is disposed on the inside of the lower portion 3 of the dispensing device.

Figure 2 shows the cartridge 1 when it has been completely pushed onto the dispensing connection portion and connected to the connection portion 2. The diaphragm at the end of the insertion connection portion is pierced and the snap hooks 19 engage into the peripherally extending groove at the upper end of the stiff casing. The stopper 7 is provided with guide ribs 7a. The region 17a involves a press fit between the dispensing connection portion and the stopper. The insert 26 is disposed in the recess in the form of the inwardly inverted region of the bottom of the casing.

Figure 3a shows the end of the stiff casing 4, the end of the lower portion of the dispensing device and the insert 26 on an enlarged scale. The insert 26 includes the micro-opening 27 which communicates with the opening 28 in the bottom of the stiff casing. Disposed in front of the

micro-opening is the filter 29. The bottom of the stiff casing is covered by the sealing foil 23.

Figure 3b shows the condition in which the piercing device 25 has pierced the sealing foil 23.

Figure 4a shows a cross-section through the withdrawal aid 30 which is fitted onto the cartridge 1 and which has pressed the stiff casing in, behind the ridge or bead 20. The cartridge is clamped in position in the withdrawal aid 30 and can be turned about the axis of the cartridge and pulled out of the dispensing device by means of the withdrawal aid.

Figure 4b shows a view from above of the withdrawal aid 30 in the condition of being fitted on the cartridge and the stiff casing 4 in cross-section. The withdrawal aid 30 includes an opening with a centrally arranged region whose diameter is substantially the same as the outside diameter of the stiff casing 4 and which is smaller than the diameter of the bead or ridge 20. The central region of the opening goes into an enlarged opening 31 so that the withdrawal aid can be easily fitted onto the end of the cartridge. The diameter of the central region of the opening is reduced at two mutually diametrally oppositely disposed locations 32 and 33 and the circular arc of the opening is flattened. At those locations, the stiff casing of the cartridge is compressed when the withdrawal aid is pushed on, whereby a tight connection is made between the withdrawal aid and the cartridge.

CLAIMS

1. A cartridge for a liquid, which can be connected to a dispensing device which includes an upper portion for receiving the cartridge and a lower portion which can be pushed over the connected cartridge, and the upper portion of the device is provided with a connection portion for the cartridge and with a dispensing connection portion for drawing off the liquid, wherein

- the cartridge (1) is a three-shell container and comprises an outer stiff casing (4), a container (5) which is stable in respect of shape and which is disposed in the casing, and a collapsible bag (6) which is arranged in the container that is stable in respect of shape and which contains the liquid, and
- the stiff casing has a bottom provided with an opening (22), and
- the container which is stable in respect of shape is provided with an opening (14) and closed by a stopper (7), and
- the stopper is provided with an insertion connection portion (17) which forms a sealingly closing, centred guide means for the dispensing connection portion, and
- the stopper is non-releasably connected by the casing (4) to the container which is stable in respect of shape, and
- the cartridge (1) is releasably connected to the connection portion (2) on the upper portion of the dispensing device.

2. A cartridge according to claim 1 wherein

- the cartridge (1) is releasably connected to the connection portion (2) by means of a plug connection.

3. A cartridge according to claim 1 wherein

- the cartridge (1) is releasably connected to the connection portion (2) by means of a screw connection or a bayonet connection.

4. A cartridge according to claims 1 to 3 wherein

- the stopper (7), preferably of a thermoplastic material, is connected to the container (5) which is stable in respect of shape, in force-locking and positively locking relationship, by means of a snap connection (8).

5. A cartridge according to claims 1 to 3 wherein

- the stopper (7) comprising a thermoplastic material is non-releasably connected to the container (5) which is stable in respect of shape and which comprises a thermoplastic material by means of a welded join with merging of the materials.

6. A cartridge according to claim 1 to 5 wherein

- the stopper (7) is provided in the insertion connection portion (17) with a funnel-shaped centred guide means which possibly includes guide ribs (7a).

7. A cartridge according to claims 1 to 6 wherein

- the stopper (7) is provided with a press fit (17a) as sealingly closing guide means, for the dispensing connection portion.

8. A cartridge according to claims 1 to 7 wherein

- the stopper (7) is provided at the end of the insertion connection portion with a diaphragm (18) which is preferably disposed inclinedly with respect to the axis of the insertion connection portion.

9. A cartridge according to claims 1 to 8 wherein

- disposed between the upper edge of the container which is stable in respect of shape and the inside of the stopper is a sealing disc (9) which is possibly provided with sealing beads.

10. A cartridge according to claims 1 to 9 wherein

- the inside of the stopper is provided with a sealing lip (10) or with a plurality of sealing lips.

11. A cartridge according to claims 1 to 10 wherein

- the stiff casing (4) - apart from the opening thereof - is diffusion-tight.

12. A cartridge according to claims 1 to 11 wherein

- the stiff casing (4) is provided with a plurality of inwardly projecting projections (4a).

13. A cartridge according to claims 1 to 12 wherein

- the stiff casing (4) is in one piece.

14. A cartridge according to claims 1 to 12 wherein

- the stiff casing is in two pieces.

15. A cartridge according to claims 1 to 14 wherein

- the stiff casing (4) is a deep-drawn metal casing, preferably of aluminium.

16. A cartridge according to claims 1 to 14 wherein

- the stiff casing (4) comprises a plastic material, preferably a thermoplastic material.

17. A cartridge according to claims 1 to 16 wherein

- the stiff casing (4) is provided at its bottom with a projecting bead (20).

18. A cartridge according to claims 1 to 17 wherein

- the stiff casing (4) has a recess in its bottom.

19. A cartridge according to claims 1 to 18 wherein

- the stiff casing (4) is provided within the recess with an opening (22) whose diameter in the case of a circular cross-section is between 0.1 millimeter and 5 millimeters.

20. A cartridge according to claims 1 to 18 wherein

- the stiff casing (4) is provided within the recess with an insert (26) including an opening, preferably in the form of a micro-opening (27), which communicates with the opening (28) in the bottom of the stiff casing, and which in the case of a circular cross-section is of a diameter of between 10 µm and 500 µm and is of a length of between 100 µm and 5000 µm.

21. A cartridge according to claims 1 to 20 wherein

- the insert (26) is provided with a filter (25) in front of the micro-opening (27).

22. A cartridge according to claims 1 to 21 wherein

- the stiff casing (4) of metal is provided with at least one peripherally extending crease (12) which embraces the stopper (7) in force-locking and positively locking relationship.

23. A cartridge according to claims 1 to 21 wherein

- the stiff casing (4) of thermoplastic material is connected to the stopper (7) by means of a welded join with merging of materials.

24. A cartridge according to claims 1 to 23 wherein

- the stiff casing (4) is provided in its upper part with a peripherally extending groove (11) which embraces the lower edge of the stopper (7).

25. A cartridge according to claims 1 to 24 wherein

- the stiff casing (4) is provided in its upper part with a flanged-over portion (13) which embraces the upper edge of the stopper (7).

26. A cartridge according to claims 1 to 25 wherein

- the cartridge is sealed in the region of the stopper (7) by a - possibly diffusion-tight - sealing foil (16).

27. A cartridge according to claims 1 to 26 wherein

- the stiff casing (4) is sealed on the outside of its bottom by a - possibly diffusion-tight - sealing foil (23).

28. A cartridge according to claims 1 to 27 wherein

- provided in the central region of the sealing foil (23) on the outside of the bottom of the stiff casing (4) is a free space (24) which is covered by the sealing foil.

29. A cartridge according to claims 1 to 28

- which can be pulled out of the dispensing device by means of a withdrawal aid (30) which can be fitted on behind the projecting bead (20).

30. A releasable connection according to claim 1 between a cartridge and a connection portion of the dispensing device, wherein

- the connection portion (2) is provided with snap hooks (19) which engage into the peripherally extending groove (11) in the upper part of the stiff casing (4) after the cartridge has been pushed into the dispensing device.

31. A releasable connection between a cartridge and the connection portion of the dispensing device, wherein

- the connection portion (2) is provided with snap hooks (19) which engage into a peripherally extending groove in the stopper (7) or in the container (5) which is stable in respect of shape, after the container which is stable in respect of shape has been pushed into the dispensing device.

32. A lower device portion which can be pushed on, according to claim 1, wherein

- the inside of the bottom of the lower device portion (3) is provided with a piercing device for the sealing foil (23) which is disposed on the underside of the bottom of the casing.

33. A cartridge according to claim 1 for an aqueous liquid, comprising a container (5) which is stable in respect of shape and which comprises polypropylene, with a stopper (7) of polypropylene and a collapsible bag (6) of polyethylene disposed in the container (5), wherein

- the stiff casing (4) comprises plastic material, preferably polypropylene, and

- the opening (22) in the bottom of the stiff casing (4) is a bore, and

- the stopper (7) for the container (5) which is stable in respect of shape is provided with an insertion connection portion (17) which is closed at its end by a diaphragm (18) inclined with respect to the axis of the insertion connection portion, and which forms a sealingly

closing, centred guide means, in the form of a press fit, for the dispensing connection portion (15), and which is connected by a snap connection to the container which is stable in respect of shape, and

- the releasable plug connection between the cartridge (1) and the connection portion (2) of the dispensing device is in the form of a snap connection in which there are provided in the connection portion (2) of the upper portion of the dispensing device snap hooks (19) which engage into the peripherally extending groove (11) in the upper region of the cartridge (1), and
- the inside of the bottom of the push-on portion (3) of the dispensing device is provided with the resilient piercing device (25) for the sealing foil (23) on the underside of the bottom of the casing.

34. A cartridge according to claim 1 for an alcoholic liquid, comprising a container (5) of polypropylene, which is stable in respect of shape, with a stopper of polypropylene and a collapsible bag (6) of polyethylene, which is disposed in the container (5), wherein

- the stiff casing (4) comprises metal, preferably aluminium, and
- the stopper (7) which is provided with an insertion connection portion (17) for the container (5) which is stable in respect of shape is closed at its end by a diaphragm (18) which is inclined with respect to the axis of the insertion connection portion, and
- the stopper (7) is provided with a sealingly closing, centred guide means, in the form of a press fit, for the dispensing connection portion (15), and
- the stopper (7) is non-releasably connected by the casing (4) to the container (5) which is stable in respect of shape, and
- the releasable plug connection between the cartridge (1) and the connection portion (2) of the dispensing device is in the form of a snap connection in which there are provided in the connection portion (2) of the

dispensing device snap hooks (19) which engage into the peripherally extending groove (11) in the upper region of the cartridge, and

- provided in the bottom of the stiff casing (4) is an inset (26) with a micro-opening (27) and the micro-opening communicates with a bore (28) in the stiff casing (4), and
- the inside of the bottom of the push-on portion (3) of the dispensing device is provided with the resilient piercing device (25) for the sealing foil (23) on the underside of the bottom of the casing.

35. A cartridge according to claims 1, 33 and 34 wherein

- the liquid contains a pharmacologically active substance.

36. A cartridge according to claims 1 and 33 to 35 for a medical liquid wherein

- the medical liquid contains one or more of the active substances Berotec (Fenoterol hydrobromide); 1-(3,5-dihydroxy-phenyl)-2-[[1-(4-hydroxy-benzyl)-ethyl]-amino]-ethanol hydrobromide), Atrovent (Ipratropium bromide), Berodual (combination of Fenoterol hydrobromide and Ipratropium bromide), Salbutamol, Salbutamol sulphate, Combivent, Oxivent (Oxitropium bromide), Ba 679 (Tiotropium bromide), BEA 2108 (di-(2-thienyl)-glycolic acid tropenol ester), Flunisolid, Budesonid and Beclomethasone.

37. Use of the cartridge according to claims 1 to 36 containing a medical liquid for producing an aerosol by means of an atomiser.

38. Use of the cartridge according to claims 1 to 37 containing a medical liquid for producing an inhalable aerosol for the treatment of illnesses.

Abstract

For meteredly dispensing a liquid over a period of several months from a container which can be stored over a long period of time, the need is for a container which is practically diffusion-tight and in which the liquid does not come into contact with the ambient atmosphere.

The cartridge according to the invention is a three-shell container comprising a collapsible bag which contains the liquid, a container which is stable in respect of shape and a stiff metal casing. The cartridge can be releasably connected to a dispensing device. The cartridge can be provided with a micro-opening with which the time for pressure equalisation between the cartridge and the ambient atmosphere can be adjusted. The cartridge is suitable for aqueous and for alcoholic liquids which contain a pharmacologically active substance. The liquid in the cartridge is protected from external influences.

The cartridge can be used in an atomiser for producing an inhalable aerosol for the treatment of illnesses.

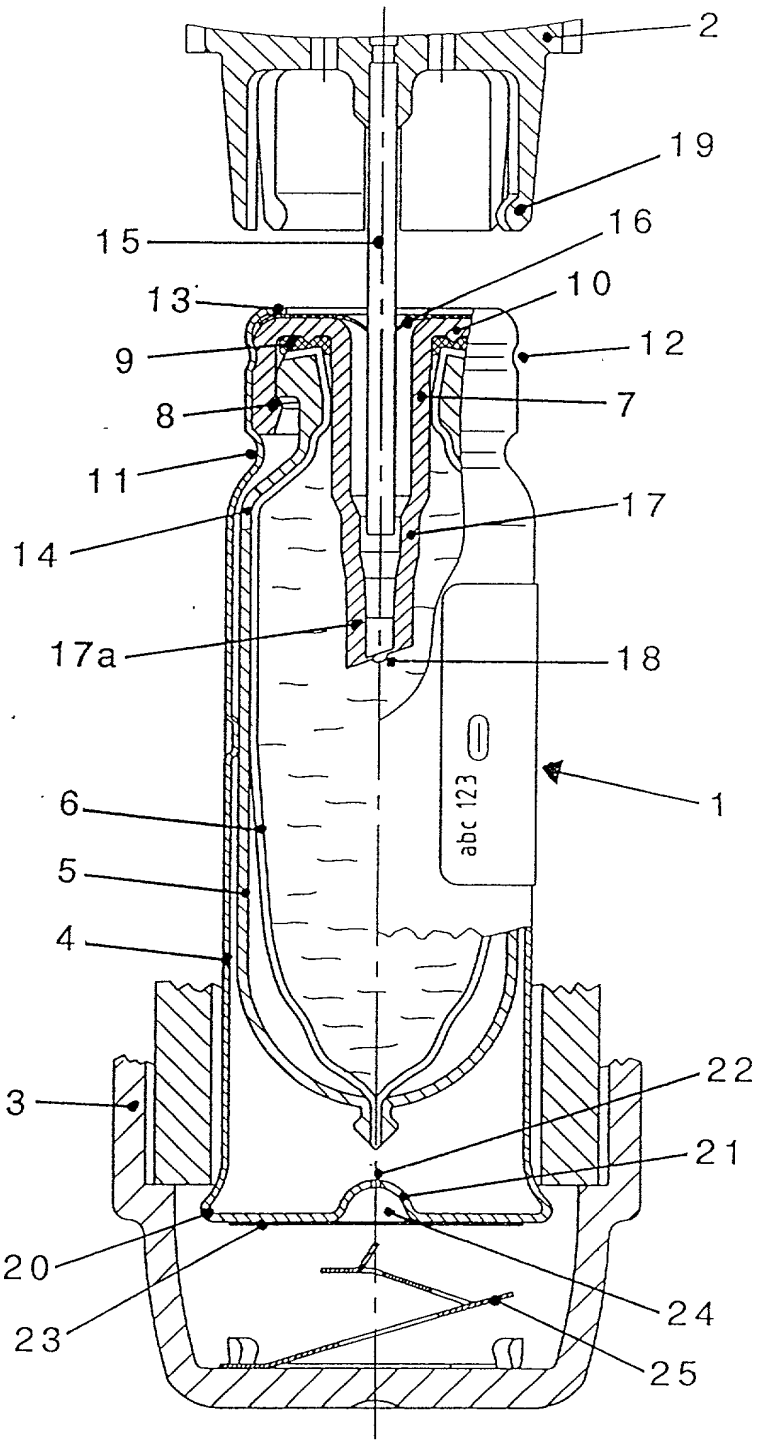
2
19
15
16
13
10
9
12
8
7
11
17
14
17a
18
1
abc 123
6
5
4
3
22
21
20
24
23
25

Fig.1

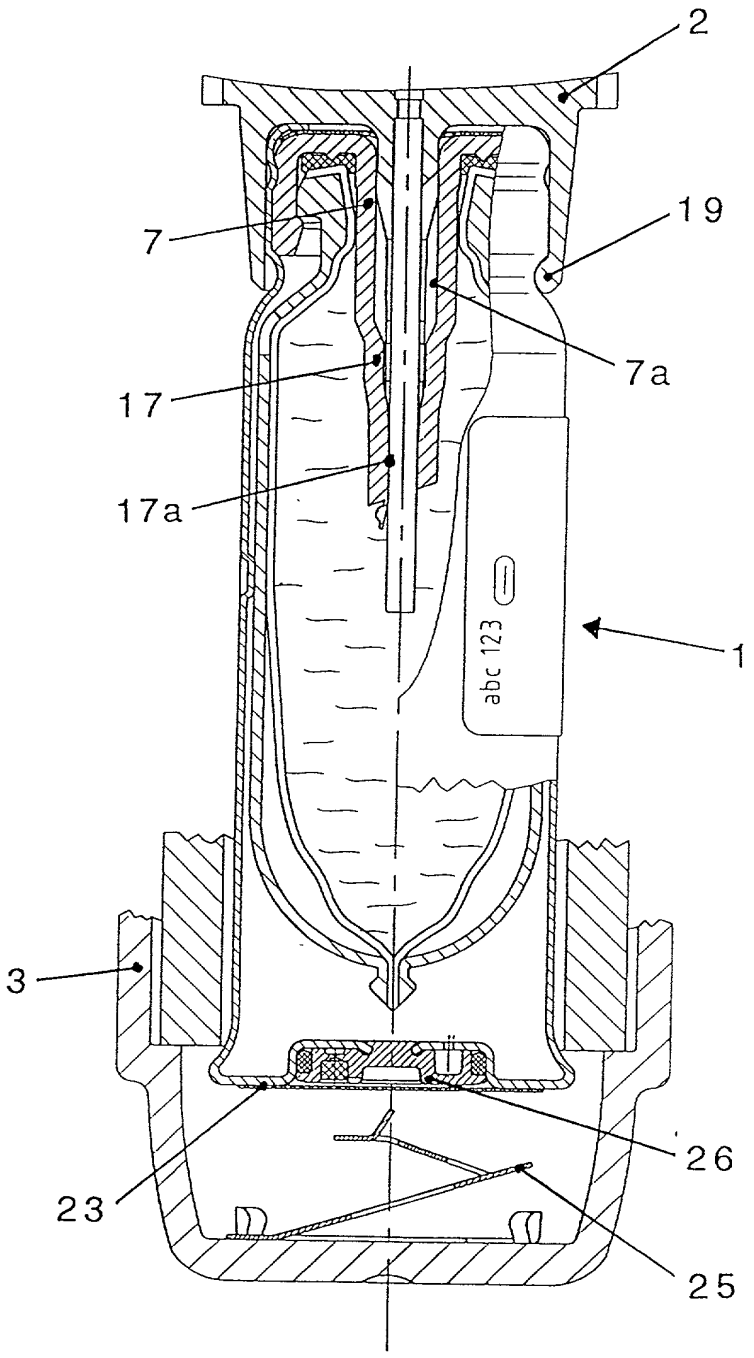

Fig.2

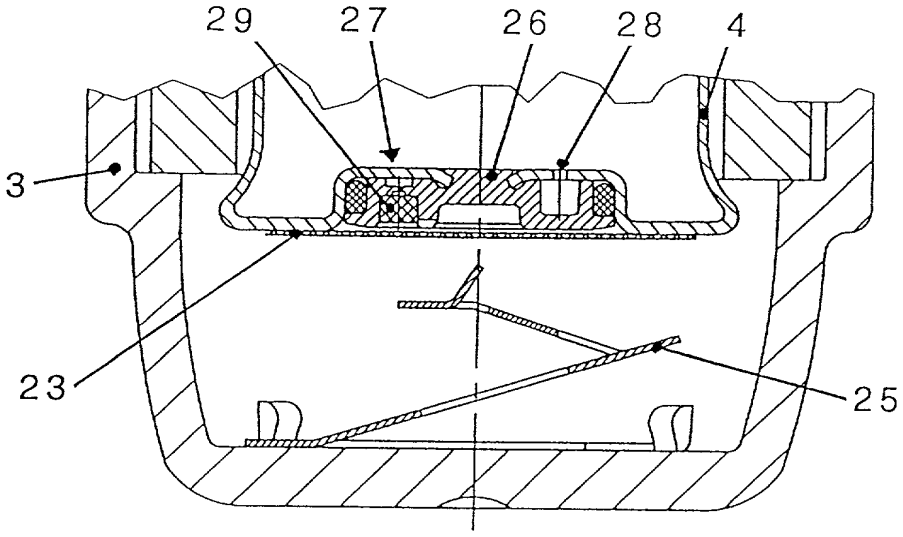

Fig.3a

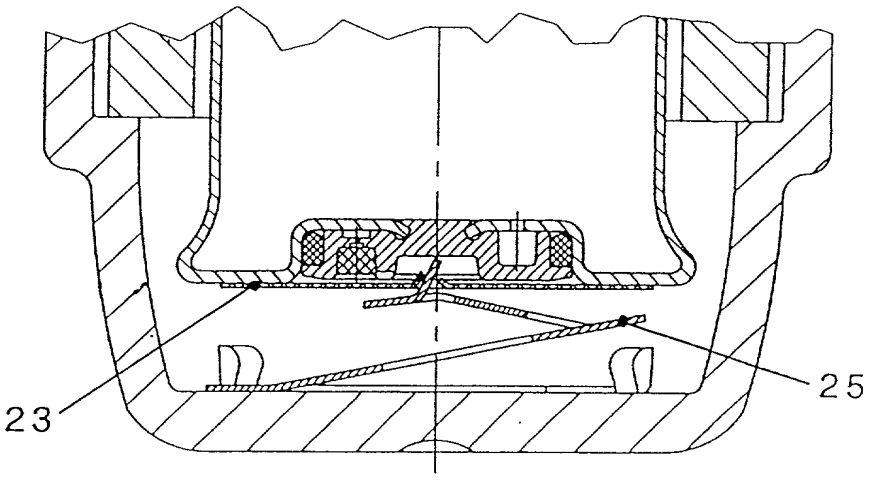

Fig.3b

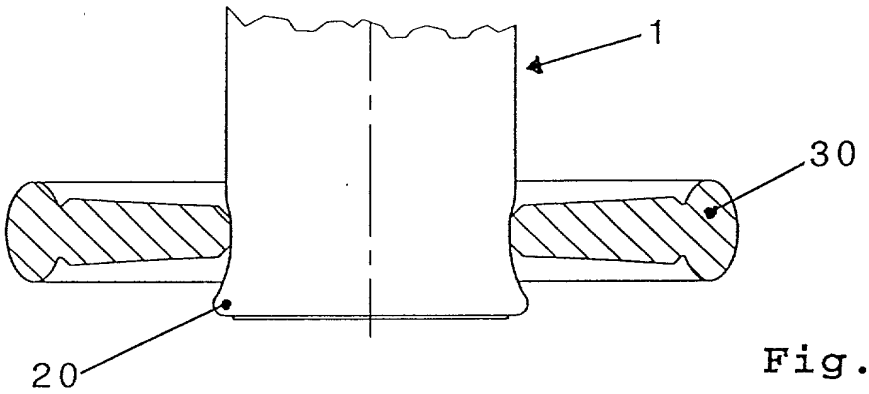

Fig.4a

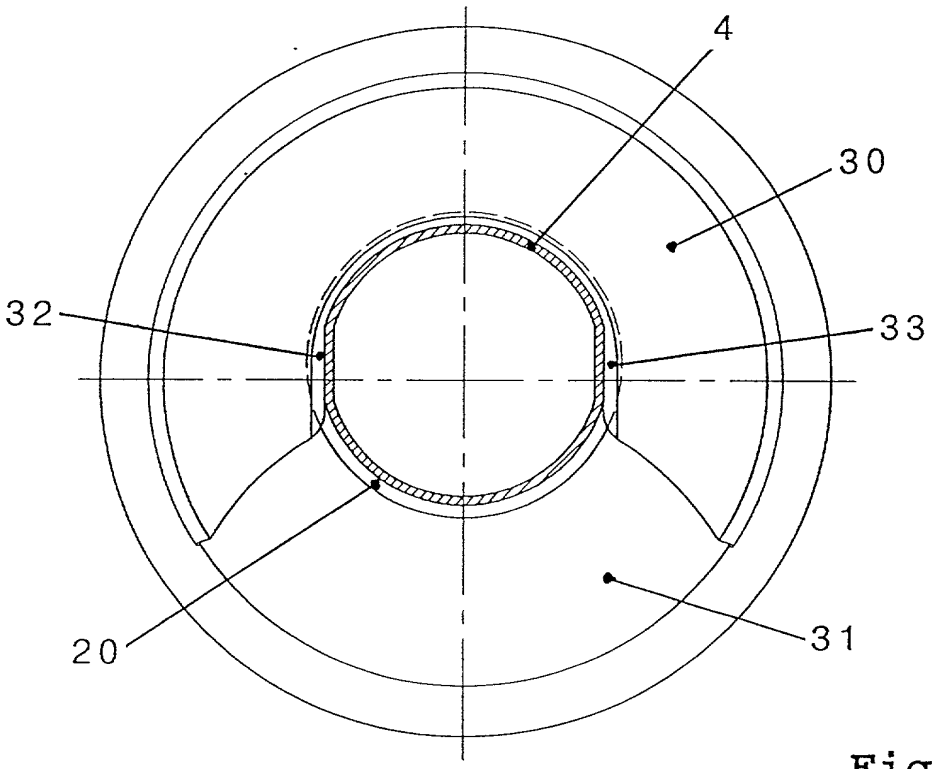

Fig.4b